

REMARKS/ARGUMENTS

Claims 1-28, 33-51, 53, 54, 56-60, 62, 64, 65, 67, 68, 77-84, 86-88 and 90-96 remain in this application. Claims 1, 7, 34, 43, 50, 60 and 86 have been amended to provide that while a device may have other sensors, possibly including cameras, that are utilized to monitor the flight characteristics of a golf ball, that the only video data utilized in determining the flight characteristics is that generated from images taken by a single camera.

The examiner rejected claims 1-28, 33-51, 53, 54, 56-60, 62, 64, 65, 67, 68, 77-84, 86-88 and 90-96 as being unpatentable under 35 USC 103 over various combinations of Gobush et al. (US 5,803,823) ("Gobush '823"), Gobush et al. (US 6,241,622) ("Gobush '622"), Sullivan (4,158,853) ("Sullivan"), Bouton (US 5,472,205) ("Bouton"), Mook (US 5,067,719), Katayama (US 6,042,483) ("Katayama"). Each of the claims was rejected as being unpatentable over Gobush '823 in view of Gobush '622, in further view of Sullivan in yet further view of Bouton

It is respectfully submitted that the Examiner, while presenting arguments in support of his rejections, has nevertheless failed to establish a prima facie case of obviousness of any of the rejected claims.

A. Claims 1-11, 33, 57-60, 65 and 67-68 are patentable over the cited references

The Examiner rejected claims 1-11, 33, 57-60, 65 and 67-68 as being unpatentable over Gobush '823 in view of Gobush '622, in further view of Sullivan in yet further view of Bouton. This rejection relates to independent claims 1, 7, 60 and certain of the claims depending therefrom. Thus, if the cited combination of references does not disclose each and every element of the independent claims, or if there is no motivation or suggestion to combine the references, a prima facie case of obviousness has not been established.

1. **The cited references fail to disclose extrapolation of perimeters of the image of the golf ball wherein the only visual image data utilized in such calculation is visual image data generated from images captured only by the single camera as recited in each of the rejected independent claims and the rejected dependent claims.**

The Examiner argues that Gobush '622 teaches an image device including a camera (36, 38) for capturing two or more images of the golf ball after impact . . . and a processor for receiving signals indicative of a temporal profile and three dimensional velocity of the golf ball by **extrapolating perimeters** of two or more images taken using the camera, and by determining three-dimensional spatial positions of the ball in said images and calculating the three dimensional velocity based on said three-dimensional spatial positions (Abstract, Col 8:39-42, Col 10:10-17, Col 13:45-50)." Office Action at pg. 3, ll. 3-9. Gobush '622 does not teach extrapolating perimeters of the images of the golf ball in order to determine the temporal profile, three dimensional velocity or three-dimensional spatial orientation. The dots on the surface of the golf ball in Gobush '622 will not necessarily be on the perimeter of the two-dimensional image of the golf ball as would be required for it to be properly argued that Gobush '622 inherently discloses the limitation in the claims. The dots, while they are on the surface of the golf ball as argued by the Examiner and could be considered to define the perimeter of the golf ball, do not define the perimeter of the image of the golf ball. As used in the claims "image of the golf ball" does not include the entire video or image frame captured by the single camera only that portion of the frame in which the golf ball is captured.

Examination of the specific citations relied upon by the examiner to establish that Gobush "extrapolates perimeters" clearly establishes that no such extrapolation occurs in Gobush. For Example, the Abstract recites:

A launch monitor system including a support structure, a first light-reflecting element disposed on this support structure, a lighting unit and a camera unit. A computer receives signals generated by light patterns received by the camera unit and computes a variety of flight characteristics for the object. The system may be moved back and forth to

vary the field-of-view of the camera unit. The system also computes and displays object trajectories from the computed flight characteristics which account for the characteristics of the object and the atmospheric conditions. Gobush '622; Abstract

This quotation mentions nothing about perimeters of the image of the golf ball. Gobush '622; Col 8:39-42 states "If only twelve dots are found in the image, the system moves on to step S107 to determine, from the dots in the images, the position and orientation of the golf ball during the first and second images." These may be oriented anywhere upon the surface of the golf ball at the time the image of the golf ball (preferably only the image of the dots is captured in Gobush '622 and not an image of the golf ball) and thus are not necessarily on the perimeter of the image of the golf ball. This again mentions nothing about extrapolation of perimeters. Gobush '622; Col 10:10-17 is a chart showing "[a]n exemplary set of these three dimensional positions for right hand calibration for the calibration fixture with 15 dots". Gobush '622; Col 10:7-9. Again, no mention of extrapolating perimeters. Gobush '622; Col 13:45-50 is a set of equations for determining "the velocity components of the center of mass V_x , V_y , V_z along the three axes of the global coordinate system". Gobush '622; Col 13:42-43. Again no mention of perimeters.

Although none of the citations provided by the Examiner establishes that Gobush '622 extrapolates perimeters of the image of the ball as recited in each of independent claims 1, 7 and 60, it is well settled that a prior art reference should be examined for what it teaches as a whole. Gobush '622, when read as a whole, teaches extrapolating three dimensional velocities and positions of the ball from the "position of the dots in the images" while ignoring the perimeter of the image of the golf ball in the image.

Gobush '622 uses at least two cameras that have been calibrated using a calibration fixture so that through triangulation the location in space of any dot appearing in the frame of both cameras can be determined, rather than extrapolating information regarding the perimeter of the image of the golf ball to obtain one of the three coordinates of the center of the golf ball. In fact, Gobush '622 does not even desire to look at the perimeter of the image of the golf ball but only at the reflective dots attached to the golf

ball. The disclosure of Gobush '622 indicates that any object that cannot with some certainty be identified as a reflective dot is ignored by the software by the following language:

At step S133, the system eliminates those areas of brightness in the image that have an area outside a predetermined range. Thus, areas that are too large and too small are eliminated. In the preferred embodiment, the dots on the golf ball are $\frac{1}{4}$ " – $\frac{1}{8}$ " and the camera has 753 x 244 pixels, so that the dots should have an area of about 105 pixels in the images. However, glare by specular reflection, including that from the club head and other objects, may cause additional bright areas to appear in each of the images. Thus, if the areas are much less or much more than 105 pixels, then the system can ignore the areas since they cannot be a marker on the ball." Gobush '622, col. 12, ll. 8-20.).

Preferably the light sensitivity setting of the camera is adjusted so that **only reflective spots** can generate white pixels on the image of the camera. ("By setting the correct threshold level for the image to a predetermined level, all pixels in the image are shown either as black or white." Gobush ' 622, col. 11, ll. 32-35; "However, if there are more or less than twelve dots or bright areas found in the images, then at step S108 the system allows the operator to manually change the images. If too few bright areas are located, the operator adjusts the image brightness, and if too many are present, the operator may delete any additional bright spots." Gobush '622 col. 8, ll. 42-48.) Thus, Gobush seeks to eliminate data regarding the golf ball perimeter in the images of the golf ball from the calculation of three dimensional position and velocity and even seeks to eliminate the perimeter of the golf ball from the images captured.

Like Gobush '622, Sullivan relies on reflective spots placed on the golf ball to provide bright spots in images captured and the X/Y position of these bright spots in the images for determination of the 3-D velocity of the golf ball. Sullivan; Col 2, ll63-68, Col 3, ll 20-41, Col 5, ll3-6 and 34-38, Col 6, ll 24-31 and Col 7, ll 19-34. Also like Gobush '622, Sullivan suppresses "all other scene elements not having retroreflective enhancement". Sullivan: Col 6, ll 10-11. Neither Sullivan nor Gobush '622 extrapolate perimeters of the image of the golf ball as required by independent claims 1, 7 and 60, on

the contrary, both references specifically teach suppressing or ignoring the perimeter of the image of the golf ball in the images captured.

As indicated by the Examiner, Gobush '823 does not teach specific tracking of the golf ball as its focus is on club head position. Similarly, Bouton focuses on determining club head position and does not track or record images of the golf ball after club head impact.. Thus, none of the references, either alone or in combination, cited for the rejection of claims 1-11, 33, 57-60 and 67-68 teaches or suggests all of the elements of the rejected claims. Since a prima facie case of obviousness has not been established, the rejection of claims 1-11, 33, 57-60 and 67-68 should be withdrawn.

While there may be a temptation to find a reference which teaches capturing of the entire image of the golf ball, including the perimeter, to combine that reference with Gobush '823, Gobush '622, Sullivan and Bouton to provide the missing element recited in the rejected claims, such a combination would be improper. As discussed above, Gobush '622 and Sullivan, by teaching suppression of all data except data relating to the position of retroreflective spots in captured images, clearly teach away from combining their disclosures with any disclosure teaching the capture of the entire image of the golf ball, including the perimeter.

2. The cited references fail to teach an image capture device consisting essentially of a single camera for outputting video data generated exclusively from two-dimensional images of the golf ball captured by the single camera for determining three dimensional data.

The Examiner indicated that "the language 'consisting essentially of a single camera' fails to limit the use of multiple cameras on at least two points On the first point in order for a the applicant to maintain the use of the language "consisting essentially of" they must demonstrate with reference to the relevant portions of their disclosure a clear indication of what the basic and novel characteristics actually are (MPEP 2111.03). On the second point the preamble limitation of "comprising" presented in all of pending independent claims would allow inclusion of multiple "single camera"(s)".

With regard to the first point, the applicant shows the examiner the following. Reading the specification as a whole provides a clear indication that applicant intended to patent a device utilizing only one camera. Nowhere in the specification as originally filed did the Applicant state that more than one camera could be utilized and the originally filed application always referred to the camera in the singular. (See e.g. App. pg. 10, ll. 8, 11, 13, 14 and 18; pg. 11, ll. 3 and 11; pg. 14, ll. 8-9, 16 and 21, pg. 15, ll. 9; pg. 18, ll. 16 and 24; pg. 19 ll. 5, 6 and 7; pg. 21 ll. 19-22 and claims 1, 7, 34, 60 and 74). This is completely different than the way the applicant referred to other items such as flash lamps where the specification indicates that one or more flash lamps may be utilized. (See e.g. App. pg. 14, ll. 8-9) Additionally, when describing the prior art US Patent Nos. 4,136,387 and 4,158,853 the Applicant stated in the originally filed specification that:

The '387 and '853 patents disclose to position three cameras or photosensors each at ninety degree spaced locations around the golfer for detection of the mark or marks wherever they may turn around the golf ball. The three photosensors cannot be combined to achieve a single planar image of the initial flight of the ball and the data captured by the three photosensors is processed according to a complex algorithm that factors the rotationally spaced locations of the sensors. Also the angular spacings of the sensors has to be very accurate or the calculated spin characteristics of the ball will be unreliable. It is desired to have a method and a system for determining the complete initial spin characteristics of the golf ball without having to sense marks on the ball in more than a single observation plane.

App. pg. 6, l. 23- pg. 7, l. 10 (emphasis added). The last sentence of the above quote provides a clear indication that utilizing a single camera (a single camera provides a single observation plane unlike the three photosensors which "cannot be combined to achieve a single planar image") to capture complete spin characteristics is a novel feature of the invention. Additionally a single camera does not require "a complex algorithm that factors the rotationally spaced location of the sensors." Finally with a single camera, the angular spacings of the sensors does not have to be very accurate to provide a reliable spin calculation.

Additionally, the applicant indicated that:

It is a further object of the invention to have a system and technique for determining the total initial spin imparted to a golf ball, including backspin and sidespin, and also preferably the three-dimensional initial flight direction of the golf ball after impact with a golf club **using a single frame including multiple temporarily successive images.**

App. pg 8, l. 22- pg. 9, l. 2 (emphasis added). The highlighted portion of the above quote can only be accomplished with a single camera and multiple cameras would generate multiple, not single frames.

These statements in the specification are similar to those made in *AK Steel Corp. v. Sollac*, 344 F. 3d 1234, 1240-1241, 68 USPQ2d 1280, 1283-1284 (Fed. Cir. 2003) cited in M.P.E.P. § 2111.03 as the types of statements satisfying the "clear indication in the specification of what the basic and novel characteristics actually are." It is believed that Applicant has carried its burden, as recited in MPEP § 2111.03, of showing that additional materials in the prior art are excluded by the recitation of "consisting essentially of" because the addition of a second or more than two cameras would materially change the characteristics of the invention.

As to the second point, based on the various statements made during the prosecution of this application and the amendments presently presented, the applicant has clearly indicated that only data generated from images taken from the single camera can be utilized

The Examiner, for the sake of furthering prosecution then indicated that Sullivan teaches the use of a single camera in figure 2 for the capture of post impact ball flight characteristics. Sullivan states that "Fig. 2 shows a block diagram of one of the measuring cameras and its associated devices." Sullivan: Col 3, ll 5-6. This statement indicates that Sullivan teaches the use of multiple cameras (identified as cameras 20, 20a and 20b) for implementation of the disclosed invention and that Fig. 2 only shows one of the multiple cameras. Thus, Fig. 2 does not teach using a single camera.

Nevertheless, Sullivan states that:

Although a three-camera measurement system is shown, other numbers of cameras may be used. For example, most of the data can be taken using a single TV camera, for example, camera 20 and a plurality of enhanced spots on the ball. Although the ability to measure displacement and spin of the ball 10 out of the plane of observation is limited in a one-camera system, the accuracy can be made satisfactory for some applications. Sullivan; Col. 3, ll 46-54.

Sullivan nowhere else in the application teaches an embodiment utilizing a single camera, nor does Sullivan disclose what types of applications a single-camera might be suitable for. Since Sullivan teaches suppressing all data other than the X/Y coordinates generated by the retroreflective spots in the captured images, it seems impossible for that data to supply sufficient information to provide three dimensional velocity and spin information. The accuracy of a Sullivan single-camera system might be able to be made satisfactory for equipment testing devices that present the face of the club perpendicular to the desired flight path with the club face passing along the desired flight path. However, in such an arrangement, since the flight of the ball is constricted to the desired vertical plane along the flight path, such a system would not calculate three dimensional position, velocity or spin. Sullivan teaches away from increasing the accuracy of a single camera system by capturing a plurality of images of a golf ball in flight including images of the perimeter of the golf ball from which motion in the plane of the camera can be determined.

With a single camera only a single perspective, i.e. a single view plane, is provided. Thus, simply determining the coordinates of the center of the ball in each image will provide no indication of movement toward or away from the camera. However, determining the relative size of the ball in each image does provide information from which the position relative to vertical plane along the anticipated line of flight. As the relative size of the ball gets bigger, the ball is moving toward the camera out of the vertical plane along the anticipated flight path. Alternatively if the relative size of the ball

gets smaller, the ball is moving away from the camera out of the vertical plane along the desired flight path.

Thus, none of the references, either alone or in combination, cited for the rejection of claims 1-11, 33, 57-60 and 67-68 teaches or suggests all of the elements of the rejected claims. Since a prima facie case of obviousness has not been established, the rejection of claims 1-11, 33, 57-60 and 67-68 should be withdrawn.

B. Claims 12-28, 34-51, 53-54, 56, 62, 64, 77-84, 86-88 and 90-96 are patentable over Gobush '823 in view of Gobush '622, in further view of Sullivan in further view of Bouton in yet further view of Mook.

The Examiner rejected claims 12-28, 34-51, 53-54, 56, 62, 64, 77-84, 86-88 and 90-96 as being unpatentable over Gobush '823 in view of Gobush '622, in further view of Sullivan in further view of Bouton in yet further view of Mook.

1. The cited references fail to disclose every element and limitation as recited in each of the rejected claims that depend from independent claims 1, 7 and 60.

As stated above, Gobush '823 in view of Gobush '622, in further view of Sullivan and further in view of Bouton fail to teach or suggest extrapolating the perimeter of the image of the golf ball and an image capture device consisting essentially of a single camera. Mook does not disclose extrapolating the perimeter of the image of the golf ball and/or an image capture device consisting essentially of a single camera. Thus, the rejection of claims 12-28, 62, 64, and 77-84, which are claims depending from one or more of claims 1, 7 and/or 60 is improper as each of the elements and limitations of the claims are not contained in the cited references.

Thus, none of the references, either alone or in combination, cited for the rejection of claims 12-28, 34-51, 53-54, 56, 62, 64, 77-84, 86-88 and 90-96 teaches or suggests all of the elements of the rejected claims. Since a prima facie case of obviousness has not

been established, the rejection of claims 12-28, 34-51, 53-54, 56, 62, 64, 77-84, 86-88 and 90-96 should be withdrawn.

2. The cited references, when properly combined, do not disclose all of the elements and limitations of claims 34-51, 53-54, 56, 86-88 and 90-96.

a. When properly combined, the references fail to teach an imaging device consisting essentially of a single camera.

As mentioned above, Gobush '823 in view of Gobush '622, in further view of Sullivan and further in view of Bouton, when properly combined, fail disclose an image capture device consisting essentially of a single camera that generates the only video data utilized in computing the three dimension positional and velocity characteristics of the golf ball. Mook does not disclose an image capture device consisting essentially of a single camera. Thus, the rejection of claims 34-51, 53-54, 56, 86-88 and 90-96 is improper as each of the elements and limitations of the claims are not contained in the cited references.

b. The cited references fail to disclose determining the spin on the ball from the curvature of the stripe or marking.

Gobush '823 in view of Gobush '622, in further view of Sullivan and further in view of Bouton, fail to disclose utilizing a golf ball with a stripe or a marking that is at least half way circumambulatory of the golf ball. While Mook does disclose a golf ball with three stripes extending around the golf ball, it does not disclose a processor utilizing the curvature of the stripe in the determination of the spin of the golf ball. Instead Mook relies upon the eye of the golfer (a processor?) to determine the spin of the golf ball based upon the perceived color of the golf ball in flight. While there is some doubt whether a golfer would have keen enough eyes to pick up the perceived color, typically a golf ball in flight appears as a black dot against the background to the eye of the golfer) it is beyond

human capacity for the golfer to perceive the curvature of the line. Thus, the cited combination fails to disclose all of the elements and limitations of the rejected claims.

Applicant acknowledges the Examiner's question's presented in the office action but believes the amendments to the independent claim renders those questions moot. Applicant would be willing to arrange an office interview or telephone conference in which representatives of applicant are present to answer the questions presented by the Examiner.

C. Claims 12-28, 34-51, 53-54, 56, 62, 64, 77-84, 86-88 and 90-96 are patentable over Gobush '823 in view of Gobush '622, in further view of Sullivan in further view of Bouton in yet further view of Katayama.

The Examiner rejected claims 12-28, 34-51, 53-54, 56, 62, 64, 77-84, 86-88 and 90-96 as being unpatentable over Gobush '823 in view of Gobush '622, in further view of Sullivan in further view of Bouton in yet further view of Katayama.

1. The cited references cannot be properly combined to disclose every element and limitation as recited in each of the rejected claims that depend from independent claims 1, 7 and 60.

As stated above, Gobush '823 in view of Gobush '622, in further view of Sullivan and further in view of Bouton fail to teach or suggest extrapolating the perimeter of the image of the golf ball and an image capture device consisting essentially of a single camera. Katayama does not teach utilizing an imaging device consisting essentially of a single camera. While Katayama does disclose that "the sideward launch angle of the ball 11 can also be calculated based on a difference in a ball diameter between an image of the golf ball 11 in the first display area 40A and that in the second display area 40 B" utilizing a two camera system rather than a three camera system, Katayama, contrary to the teaching of Gobush '622 and Sullivan captures a complete picture of the golf ball rather than only the retroreflective material attached to the golf ball. Thus, Gobush '622 and Sullivan, with their emphasis on eliminating, suppressing or ignoring all data except

that attributable to reflections from the retroreflective spots teaches away from being combined with Katayama.

2. The cited references, when properly combined, do not disclose all of the elements and limitations of claims 34-51, 53-54, 56, 86-88 and 90-96.

a. When properly combined, the references fail to teach an imaging device consisting essentially of a single camera.

As mentioned above, Gobush '823 in view of Gobush '622, in further view of Sullivan and further in view of Bouton, when properly combined, fail disclose an image capture device consisting essentially of a single camera. Katayama does not disclose an image capture device consisting essentially of a single camera. Thus, the rejection of claims 34-51, 53-54, 56, 86-88 and 90-96 is improper as each of the elements and limitations of the claims are not contained in the cited references.

b. The cited references fail to disclose determining the spin on the ball from the curvature of the stripe or marking.

Gobush '823 in view of Gobush '622, in further view of Sullivan and further in view of Bouton, fail to disclose utilizing a golf ball with a stripe or a marking that is at least half way circumambulatory of the golf ball. While Katayama does disclose a golf ball with two stripes extending around the golf ball, it does not disclose a processor utilizing the curvature of the stripe in the determination of the spin of the golf ball.

Instead Katayama states:

Reference numeral 60e denotes a line marked on the golf ball 11 along the equator thereof, and numeral 60f denotes a line marked on the ball 11 perpendicularly to the line 60e (sic.). For example, a change in the angle of the line 60e between the first display area 40 A and the second display area 40B is measured, Then based on the thus-measured change of the angle and the time t3 (Fig. 3), the amount of backspin (angular velocity) is obtained. Further, through the measurement of the movement of a certain point on the spherical surface of the ball 11 (this movement appears in the form of a difference in the appearance between the first and second display areas 40A and 40 B), the amount of side spin can be obtained likewise. Katayama Col 4, ll 14-26

Thus, Katayama fails to even mention the curvature of the line or marking and thus fails to utilize this characteristic of the image of the stripe or marking on the ball to determine spin on the ball.

Conclusion

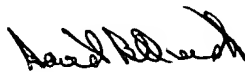
Applicant also wishes to express their appreciation to the Examiner for his efforts in attempting to reach mutually agreeable claim language. Applicant hopes that the amendments submitted will be viewed, as they are intended, as precluding the use of multiple cameras for generating the video image data used by the processor to determine the balls flight characteristics. However, applicants do not wish to surrender coverage of a device wherein an additional camera is added to capture images which images are not utilized by the processor in the manner required by the claims as amended.

Applicant, as a small entity, is submitting a request for a three month extension of time to and including September 14, 2006 for responding to the office action of March 14, 2006 along with an authorization to charge the \$510.00 fee to the Applicant's attorneys' deposit account 09-0007. All fee for excess claim have previously been paid and the number of claims and independent claim pending in the application has not been increased by this amendment.

Based on the foregoing, Applicant respectfully submits that claims 1-28, 33-51, 53, 54, 56-60, 62, 64, 65, 67, 68, 77-84, 86-88 and 90-96 are in condition for allowance. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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Appl. No. 09/495,407
Amendment dated Sept. 14, 2006
Reply to Office Action of Mar. 14, 2006

bcc: Mr. Art Felsher

Appl. No. 09/495,407
Amendment dated Sept. 14, 2006
Reply to Office Action of Mar. 14, 2006

bcc: Stacy Webb

[PLEASE NOTE: DEPOSIT ACCOUNT CHARGE OF \$510.00]